Final Implementation Report

2008 – 2009

NW DUCTLESS HEAT PUMP PROJECT

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NORTHWEST ENERGY EFFICIENCY ALLIANCE

Program Background & Objectives

An initiative of the Northwest Energy Efficiency Alliance, the NW Ductless Heat Pump Project (Project) launched on October 1st, 2008. The implementation phase of the pilot came to an end on December 31st, 2009, but Project evaluation is continuing until 2012.

The primary objectives of this Project included:

- Demonstrating the use of inverter-driven ductless heat pumps (DHPs) to displace electric resistance space heat in existing Northwest homes
- Supporting evaluation efforts to document Project implementation and determine the costs and potential energy savings of ductless heat pumps in this application
- Examining non-energy benefits and potential barriers to large scale implementation of DHPs
- Building a regional infrastructure to sustain and accelerate market growth

This report on 2008-2009 implementation activities provides an overview of Project highlights, key success, and lessons learned.

Pre-Pilot Market Overview

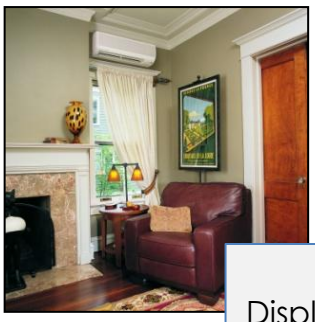
Prior to the NW Ductless Heat Pump Project, the domestic residential DHP market was characterized by low market penetration and a lack of consumer awareness. Ductless heat pumps constituted roughly 1% of the residential and commercial HVAC market and less than 5% of Americans had ever heard of the technology. Focus groups and interviews conducted with market actors and consumers for the June 2008 Market Research Report[1] provided insight into pre-Pilot market activity and identified potential barriers for widespread adoption of DHP technology. In addition, program staff engaged in meetings with manufacturers, distributors, and contractors prior to the Project launch to gauge interest, inform program design elements, and further understand existing market barriers. These meetings were conducted from July through September, 2008.

Manufacturer & Distributor Landscape

In 2008, the leading manufacturers of DHPs sold in the U.S. reported that DHPs were perceived as a solution for problem zones rather than whole-house heating and cooling systems. Since these systems were regarded as appropriate primarily for applications such as bonus rooms or add-ons, manufacturers were not promoting DHPs as an energy efficiency measure or as an alternative to zonal electric heat.

Pre-pilot meetings with manufacturers and distributors revealed that many DHP distributors warehoused an extremely limited number of units, which were reportedly difficult to move. While manufacturers and distributors initially hesitated to buy off on displacement theory[2], many did express an interest in collaborating with utilities.

Target home with existing electric heat



DHP Displacement

[1] "Ductless Heat Pump Market Research and Analysis" Market Research Report, prepared by NAHB Research Center, June, 2008.
[2] Displacement Theory suggests consumers can maximize cost-effective energy savings by installing a single indoor unit in the main living area of the house (living/family room, dining room, or kitchen) to displace the use of electric resistance heat in the primary zone of a home. The DHP becomes the primary heating system for the main living area while the existing electric heating system remains in place to supplement the DHP as needed.

Pre-Pilot Market Overview (cont.)

Contractor Buy-in
The Market Research Report identified a number of obstacles to contractor acceptance and adoption of DHPs. These findings were also supported by interactions with the supply chain prior to the Pilot kick-off. Much like manufacturers, HVAC contractors viewed DHPs as solely application specific rather than an efficient alternative to zonal electric heat. Because these systems were viewed as appropriate for a limited proportion of customers, contractors were reluctant to seek out product training and begin actively promoting this technology.

Furthermore, some contractors reported a lack of access to product training and perceived a lack of product support. These parties reported a desire for more manufacturer-sponsored training and educational opportunities to increase their proficiency installing DHPs.

Lastly, contractors did not feel adequately equipped to address consumer objections regarding the unit's appearance. Contractors felt that the indoor units were perceived as unappealing and that consumers might object to refrigerant/condensate lines being attached to the side of their house.

Consumer Impressions
The primary barrier to market adoption of ductless technology in the Northwest is consumer awareness. With few manufacturers promoting ductless systems to consumers, many are unaware that DHPs even exist. Moreover, occupants of homes with expensive baseboard heat—the Project's target home type—are unaware that alternative heating options or systems are available for their home.

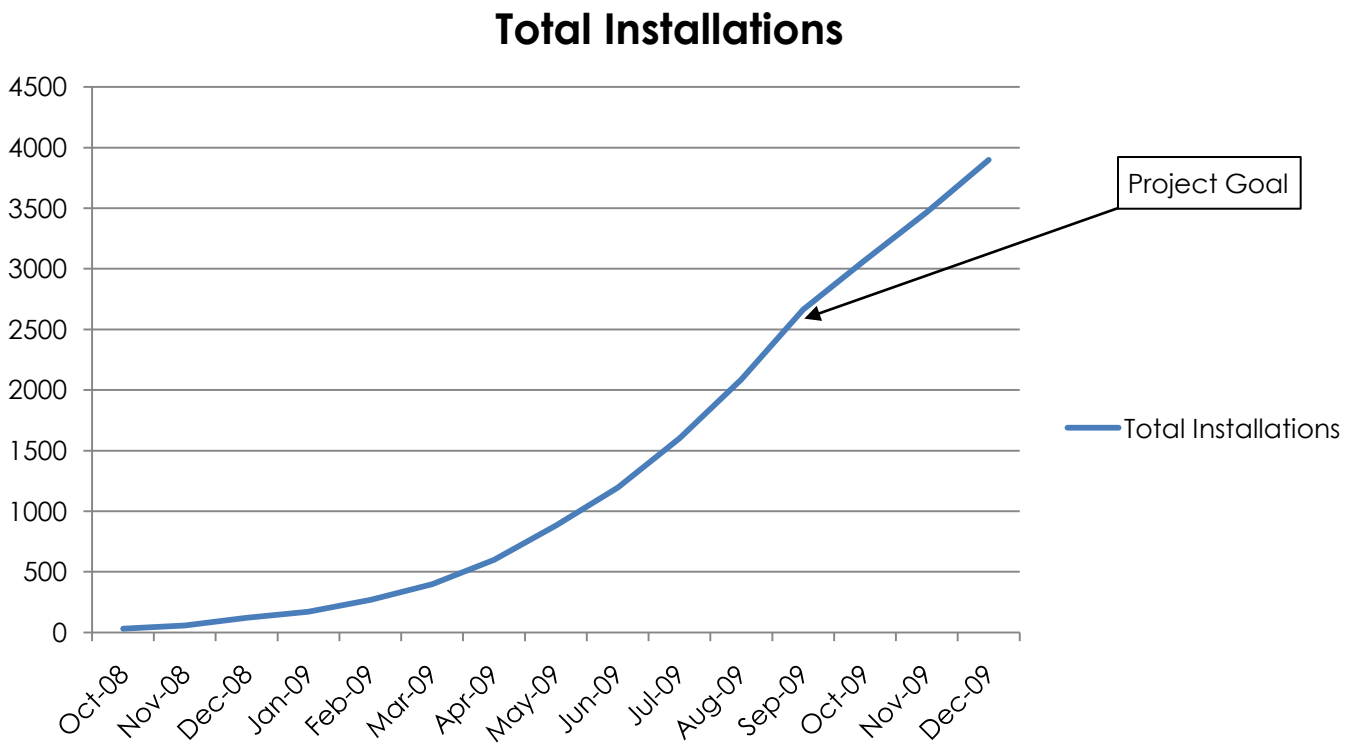
Additional consumer objections include the appearance of the indoor unit and outdoor refrigerant lines. However, manufacturers, contractors, and consumers alike have reported that the unit's appearance becomes less of an issue after installation, indicating that aesthetics might be overplayed as a market barrier.

In the 2008 Market Research Report, consumers and contractors reported that system cost was another potential objection. Many consumers find that a multi-zone, whole house ductless system is above their price point. However, the displacement theory can make DHPs more accessible for many consumers by offering a cost-effective way to save energy.

Installation Highlights

With 3,899 units installed by December 31st, 2009, the NW Ductless Heat Pump Project exceeded the goal of 2,500 installations by 60%[3].

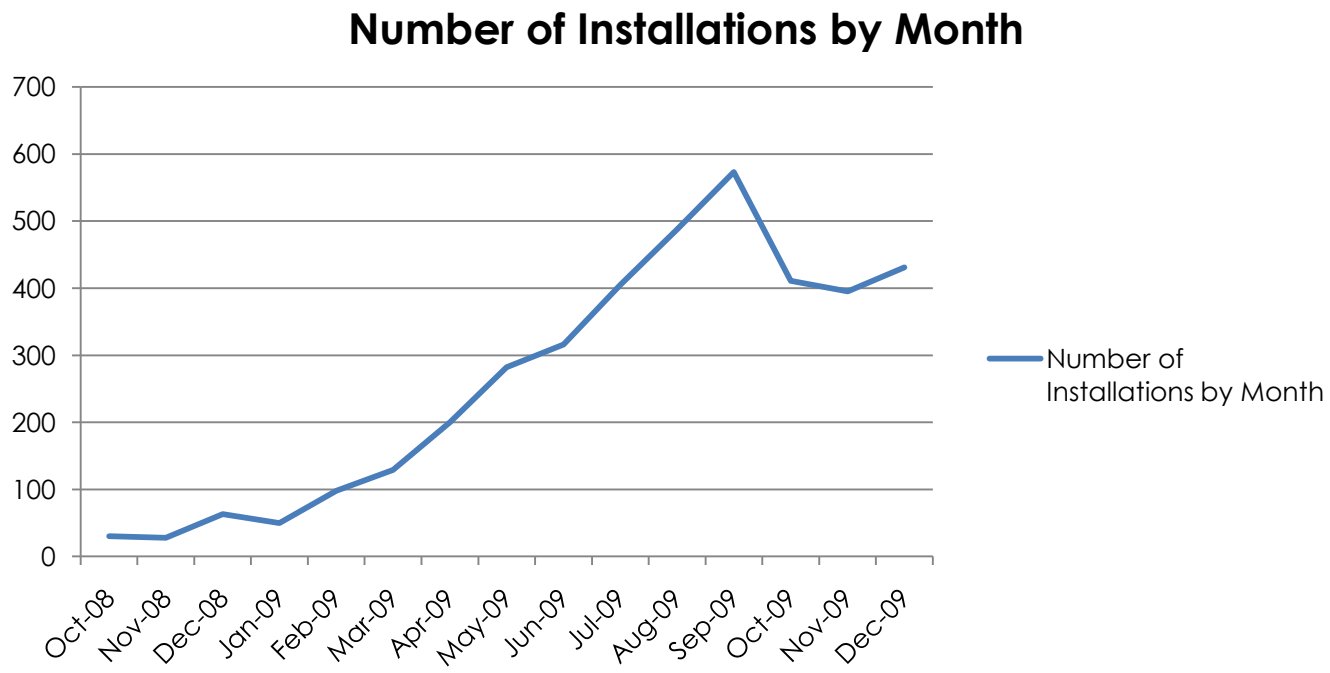
The chart below documents the Project's total progress toward the installation goal.



[3]Through February 22nd, 2010, the Project received paperwork for 3,899 installations that occurred in 2008 and 2009. However, as contractors continue to submit paperwork for 2009 installations, the actual number of pilot installations may continue to grow, exceeding 3,899.

Installation Highlights (cont.)

This chart illustrates the number of installations for each month, providing a clear picture of periods with the greatest activity.



During the Pilot phase, a number of factors may have played a role in determining the level of installation activity each month. After the October 1st, 2008 launch, the Project began gradually ramping up for the first few months of the Project. This early stage of the Project focused on developing a contractor base, promoting utility marketing, and creating marketplace momentum.

Key weather events in the Northwest region may also have played a role in installation activity. Record-breaking heat in late July 2009 may account for the steep increase in installations during that time period, while the region experienced extreme cold during December, 2008 and December, 2009.

Utility Partners

Project Implementation Strategy

Utility buy-in was critical to the overall success of the Ductless Heat Pump Project. Early in the Project, efforts were focused on reaching out to utilities across the region and developing an infrastructure of utility participants. As the Project ramped up, the team created numerous resources and tools for utilities, established channels of communication to provide participants with Project updates and findings, and developed mechanisms for obtaining feedback from utilities.

Ramp Up Activities

Leading up to the October 1, 2008 Project launch, the team engaged regional utilities and stakeholders through a series of conference calls and face-to-face meetings designed to gauge interest, and to provide an overview of DHP technology and Project objectives. These meetings also offered the team the opportunity to gather stakeholder feedback and input and adjust Project strategy accordingly.

- Kick-off meetings took place in the following markets: Tri Cities, Spokane/Coeur d'Alene, eastern Idaho/western Montana, Puget Sound, Eugene, and southwest Washington.

In the early stages of the Project, the team also engaged interested utilities by conducting call-downs to determine participation details, incentive amounts, and the projected number of units to be installed in each territory. Participation information was compiled into a Utility Participation List, which was posted to the website as a valuable resource for market actors. Unit projections, on the other hand, served as a forecasting mechanism for the Project, which informed marketing and evaluation efforts. The forecasts helped the team ensure that utility goals would be supported by qualified contractors and that sufficient installs would take place in each climate zone for measurement purposes.

- At the outset of the Project, 59 utilities indicated an interest in participating; by the end of 2009, that number had climbed to 80.

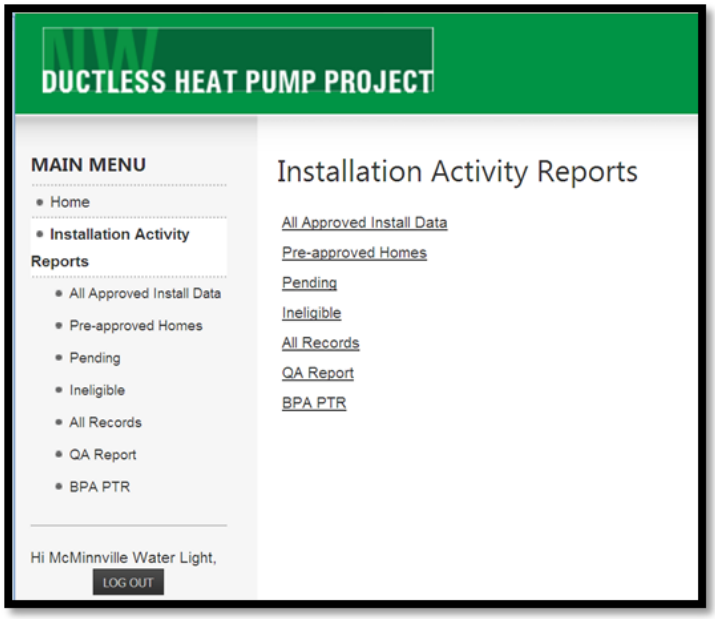
Utility Partners

Project Implementation Strategy (cont.)

Utility Resources

The Project developed a number of utility resources, which were made available through the regional website www.nwductless.com. Key tools included:

- Oriented contractor list
  - With each new contractor orientation, the team updated the Oriented Contractor List, allowing utilities to easily determine which contractors in their territory were qualified to install.
- Regional database
  - While the Project had not originally planned to create a utility installation database, the team realized that such a tool would provide utilities with substantial value and complement the paperwork process. The utility database evolved from a simple data report that was updated twice per week, to a live database with several reports.



- Customizable marketing templates
  - The marketing team created a variety of utility marketing templates, such as bill stuffers, newsletter articles, and bill stuffers.

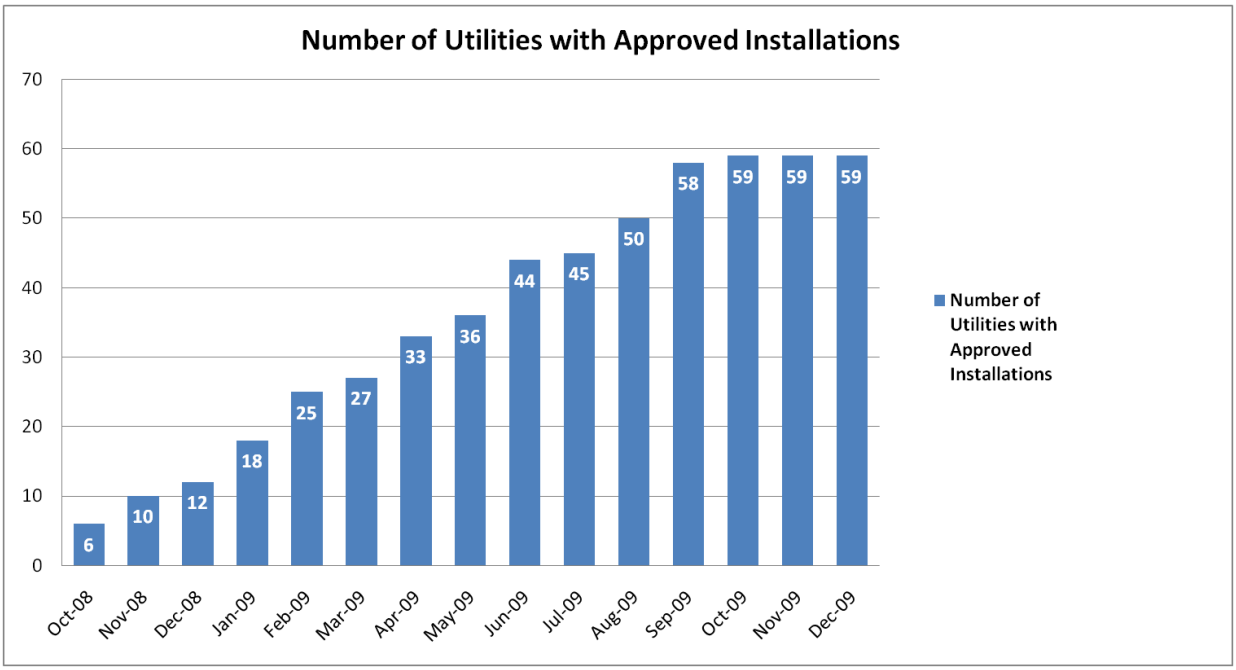
Utility Communication

By setting up quarterly Utility Update Webinars, the Project established a forum for communication and a mechanism for utilities to provide feedback. The Webinars had an average of 28 utility representatives in attendance, and featured topics such as progress to date, upcoming activities, program highlights, and marketing tactics. Utilities provided valuable feedback on their concerns and successes stories, which the team was able to incorporate into the program strategy.

Utility Partners

Project Successes

Utility participation steadily increased over the course of the Project. The chart below demonstrates a steady increase in the number of unique utilities with approved installations by December 31st, 2009.



www.NWDuctless.com

The Project frequently encouraged utilities to make use of the Project documents and resources available through the regional website www.NWDuctless.com. From its launch in mid-October 2008, the website received steady traffic from utility participants. The following web analytics highlight the pages most frequented by utilities, and the number of visits to each one:

Utility participation forms	Utility Project Information	Utility Database
4,455 pageviews	2,390 pageviews	1,441 pageviews
3,756 unique visitors	1,881 unique visitors	1,030 unique visitors

For general www.NWDuctless.com web analytics, please see the General Project Successes section at the end of this report.

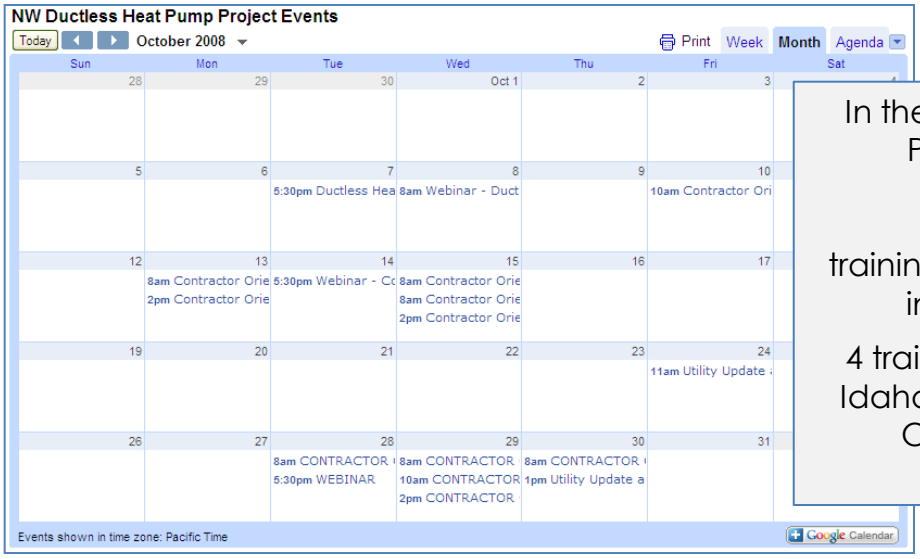
Manufacturers & Distributors

Project Implementation Strategy

At the outset of the Project, the prevailing view among manufacturers and distributors was that the residential ductless heat pump market was limited to niche applications such as bonus rooms and workshops. Supply chain actors reacted favorably to the prospect of utility support for ductless systems, but the team still had to build consensus regarding the target market and the opportunity for DHPs as an efficiency measure. The Project leveraged existing relationships between distributors and contractors to educate the market about displacement theory and to develop a regional installer base.

Manufacturer and Distributor Networks

The Project engaged with manufacturers and distributors of ductless systems to identify products available for purchase in the Northwest that were supported by manufacturer technical trainings and that met the Project equipment requirements[4]. The team collaborated with distributors to deliver technical trainings and Project orientations to contractors across the region, and in doing so, increased supply chain awareness of displacement theory. This strategy emphasized cost-effectiveness by leveraging the distributors' ability to draw a critical mass of their customers together for a single event that would qualify them to install for the DHP Project. Furthermore, the Project's efforts promoted increased manufacturer training opportunities throughout the region, which were not widely available to contractors before the Project began coordinating these events.



In the early months of the Project, the team coordinated 34 manufacturer training/Project orientations in 14 key markets.

4 trainings were hosted in Idaho, 3 in Montana, 12 in Oregon, and 15 in Washington.

[4]To qualify for the Project, the equipment must be a ductless split system heat pump employing inverter-driven outdoor compressors and inverter-driven or variable speed indoor blowers. Indoor units using any type of field-installed duct system are ineligible.

Manufacturers & Distributors

Project Implementation Strategy (cont.)

Supply Chain Resources and Support

The Project developed several resources for manufacturers and distributors to support their involvement with the Project. Key tools included:

- Project event calendar at www.NWDuctless.com
  - By encouraging supply chain actors to submit details of their upcoming events for the Project calendar, the Project promoted increased contractor attendance at industry events and kept contractors up-to-date on training opportunities.
- Utility Participation List and Oriented Contractor List
- Monthly newsletters
  - Toward the second half of the Project, the team began distributing monthly newsletters to manufacturers and distributors to communicate Project activities and progress. Each newsletter provided an update on installations by manufacturer and state, as well as Project Quality Assurance findings. The "Notes from the Field" section afforded the Project the opportunity to communicate installation trends issues like improper refrigerant practice and lack of line set protection upstream to manufacturers. As a result of these communications, some manufacturers created refrigerant "cheat sheets" to highlight refrigerant specifications and distributors informed their staff that line set protection was a Project requirement. For additional details on how the Project promoted proper refrigerant protocol, please see the Quality Assurance: Project Successes section.

Distributor Marketing and Promotion

The Project provided distributors with Project marketing support by coordinating display units for internal trainings, utility use, and home shows, as well as attending distributor-hosted contractor barbeques and open houses to provide an overview of the Project and encourage contractor participation.

Manufacturers & Distributors

Project Successes

The NW Ductless Heat Pump Project Workshop

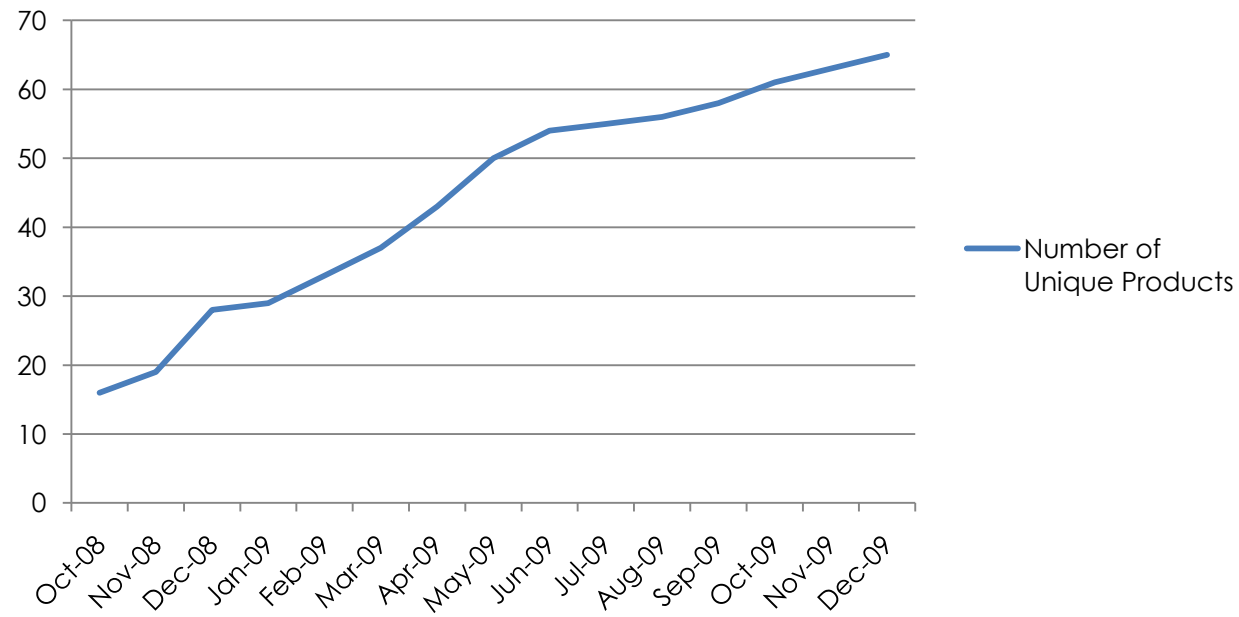
One significant indicator of manufacturer and distributor buy-in in the Project was supply chain involvement in the NW Ductless Heat Pump Workshop. Over 30 distributor representatives attended the event, along with representatives from the region's largest manufacturer players.

Manufacturers and distributors expressed their satisfaction with the event, indicating that it solidified their relationship with the Project and presented new networking opportunities for their organizations. Many event sponsors reported that they were looking forward to similar events in the future. For more details on the Workshop, please see the General Project Successes section at the end of this report.

Increased Product Variety Installations

Over the course of the Project, the team saw an increasing variety in the product being installed and a shift in the market share of each manufacturer on Project qualified installations.

Number of Unique DHP Models Installed During Project

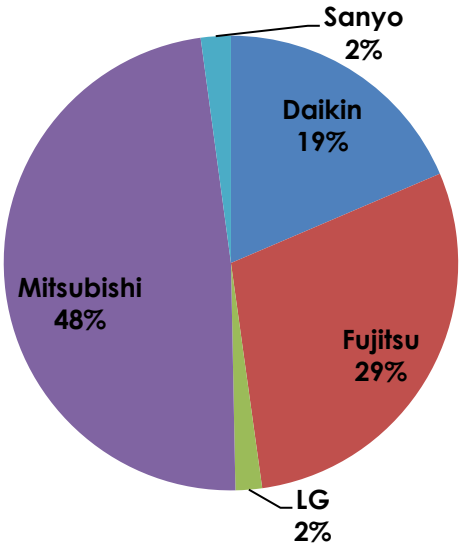


Manufacturers & Distributors

Project Successes (cont.)

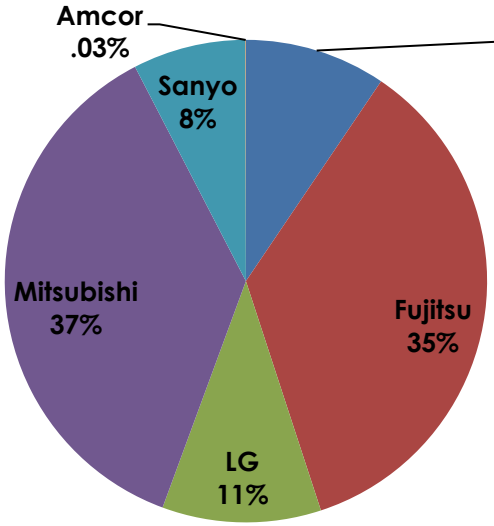
The charts below demonstrate installation activity by manufacturer and state as of June 2009, contrasted with those figures at the end of the Project. During the last half of the Project, the team saw a significant increase in the proportion of Sanyo, LG, and Fujitsu systems installed, and a decrease in Mitsubishi, and Daikin.

Installations by Manufacturer June 2009



	State				
Manufacturer	Idaho	Montana	Oregon	Washington	**Total**
Daikin	2	0	10	68	**80**
Fujitsu	15	2	110	53	**180**
LG	0	0	5	5	**10**
Mitsubishi	14	3	73	147	**237**
Sanyo	0	3	6	4	**13**
Total	**31**	**8**	**204**	**277**	**520**

Installations by Manufacturer Through December 2009



	State				
Manufacturer	Idaho	Montana	Oregon	Washington	**Total**
Amcor	0	0	0	1	**1**
Daikin	40	2	83	214	**339**
Fujitsu	87	40	735	606	**1468**
LG	5	0	309	154	**468**
Mitsubishi	116	74	351	804	**1345**
Sanyo	9	12	93	164	**278**
Total	**257**	**128**	**1571**	**1943**	**3899**

Manufacturers & Distributors

Project Successes (cont.)

Manufacturer and Distributor Anecdotes

Manufacturers and distributors consistently report that the Project had a positive impact on consumer awareness and acceptance of ductless heat pumps, and stimulated sales for their companies. When questioned about their overall experience with the Project, supply chain members provided the following feedback:

> The program has definitely increased activity through product awareness by the consumer. Having a third party group that advertises and supports the product helped. The unbiased party has given credibility to the message we were preaching, which is energy savings.
>
> -JR de la Cruz, Regional Manager, Mitsubishi Electric HVAC

MITSUBISHI ELECTRIC
Cooling and Heating Solutions

> Ductless heat pumps have been a great shot in the arm for our company and I think the Project served as a catalyst in the evolutionary process of this market.
>
> -Matt Popma, Johnstone Supply, VP of Sales & Marketing

JOHNSTONE SUPPLY

> DHPs were one of the best sources of revenue in the poor economy, and filled a void created by decreased sales of other equipment. Our company saw DHP sales increase by at least 500% from early 2008 to late 2009. In fact, ductless sales in September 2009 exceeded sales from all of 2008.
>
> - Gary Jordan, Sales Representative, Gensco Inc.

GENSCO

Trade Allies

Project Implementation Strategy

Perhaps even more so than manufacturers and distributors, contractors in the Northwest perceived ductless heat pumps as an application specific technology with limited market potential before the NW Ductless Heat Pump Project. The Project's early efforts and outreach were focused on educating contractors about displacement theory and communicating the market opportunity presented by electrically heated homes across the region. Contractors that adopted the displacement theory and DHPs as an energy saving technology for their customers were able to identify appropriate target homes and generally found, as the Project had hypothesized, that the technology has a positive impact on their businesses and on the satisfaction of their customers.

Cultivating a Robust Trade Ally Network

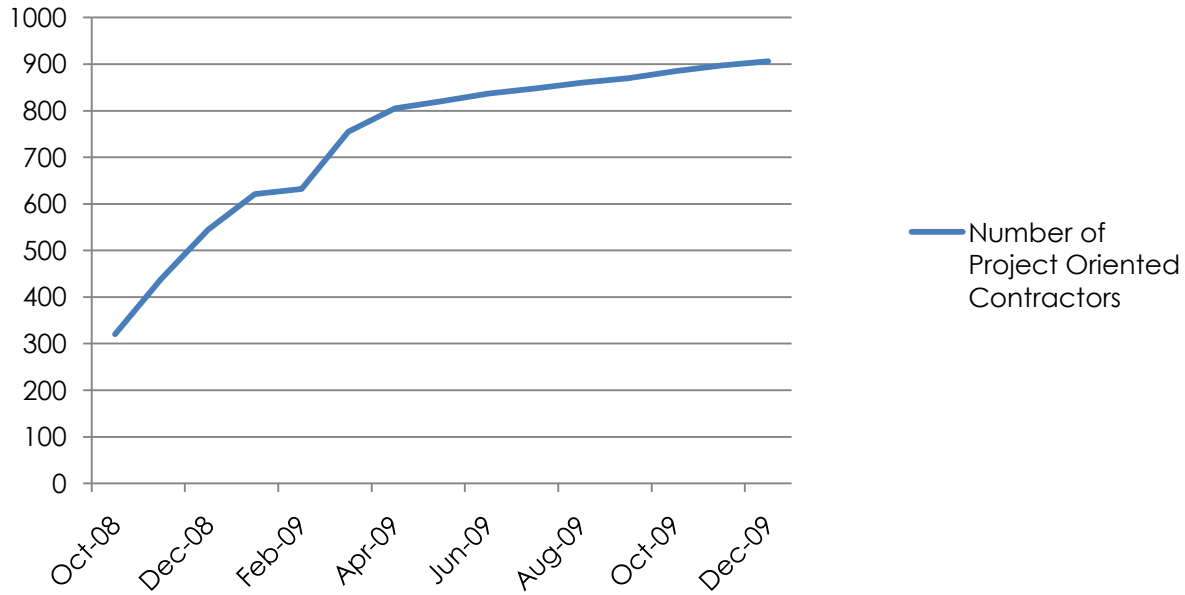
In order to develop a regional contractor base across the region, the Project collaborated with manufacturers and distributors to offer product training and orientation sessions across the region. After targeting several key markets through these face-to-face meetings, the Project shifted to web-based orientations, which allowed contractors continued access to Project participation, maximized cost-effectiveness, and provided the opportunity to deliver the orientations with regular frequency. After the Project ramp-up in late 2008, the team began hosting orientation Webinars once per month. However, the team shifted to two Webinars per month by May, 2009, in order to expedite the participation process for contractors and to respond to the high level of contractor interest. Webinars were hosted twice per month for the duration of the Project. During the presentation, contractors gained familiarity with displacement theory and were provided an overview of installation eligibility, paperwork processes, and Project resources available for their use.

Trade Allies

Project Implementation Strategy (cont.)

During the Pilot, a total of 906 contractors representing 602 unique companies attended a Project orientation. The chart below illustrates how the Project quickly ramped up to establish a regional contractor base, and then scaled back to bi-monthly Webinars that continued to be attended by an average of 8.5 contractors per orientation.

Number of Project Oriented Contractors



Contractor Resources and Support

An important element of Project implementation was the ability to take contractor feedback and lessons learned in the field and translate that into the Project strategy. The team sought to continually refine and modify website resources, marketing tools, and communication mechanisms to reflect the needs of the marketplace.

www.NWDuctless.com

Contractors were frequently directed to www.nwductless.com as a source of Project documents and information. Key website resources available to contractors included the Utility Participation List, participation forms and paperwork process flows, an event calendar, a cost of heat worksheet, and marketing templates. Later additions to the website included a quick guide for homeowners and an archive of monthly newsletter communications, as well as a web tracker tool highlighting total number of units installed throughout the region.

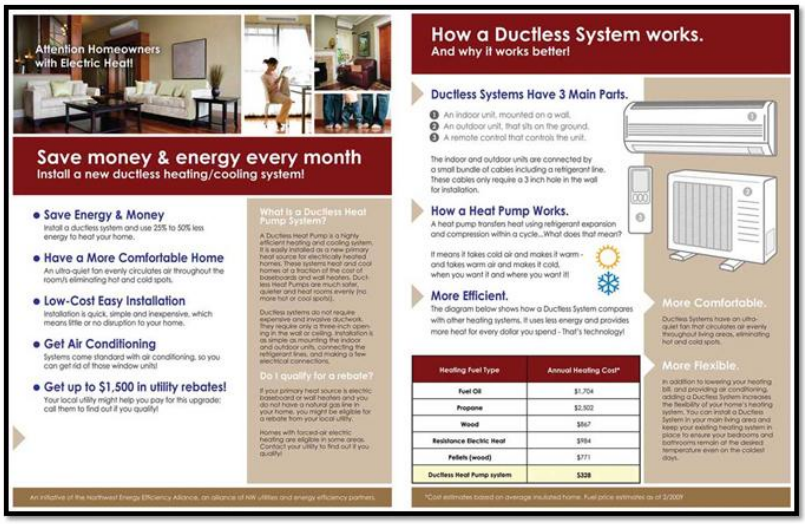
Trade Allies

Project Implementation Strategy (cont.)

Sales and Marketing Tools

Initial contractor marketing support was provided by way of website marketing templates that came in many varieties and were easily customized. However, contractors indicated that they faced obstacles closing DHP sales and needed additional tools to overcome consumer objections and communicate the displacement approach. The Project addressed this issue in two primary ways:

- Contractor sales sheet
  - In early 2009, the Project developed an 8.5"x11" sales sheet that outlined the benefits of ductless systems, provided an overview of anticipated energy savings and available incentives, and were easy to customize for contractors. This sales sheet was designed as versatile takeaway piece for contractors to use at home shows, to have in the office, and to give potential customers of ductless systems.



- Sales trainings
  - The Project also reached out to contractors through training sessions focused on overcoming consumer objections and making the sale. In addition to educating contractors, the team's goal for these trainings was to jumpstart markets that had less DHP activity than the rest of the region and identified Tri Cities, Spokane, and Idaho as training sites.
  - Although attendees of the sales trainings in the Spokane area and across Idaho reported that the sessions were informative and helpful, the Project scaled back face-to-face sessions by late summer 2009 and instead opted to incorporate elements of the sales trainings into the contractor orientation.

Trade Allies

Project Implementation Strategy (cont.)

In addition to the sales trainings, the Project established a lead generation mechanism for oriented contractors through www.GoingDuctless.com. Consumers pointed to the website by their utility could easily connect to qualified installation contractors in their region through the website Contractor Finder.

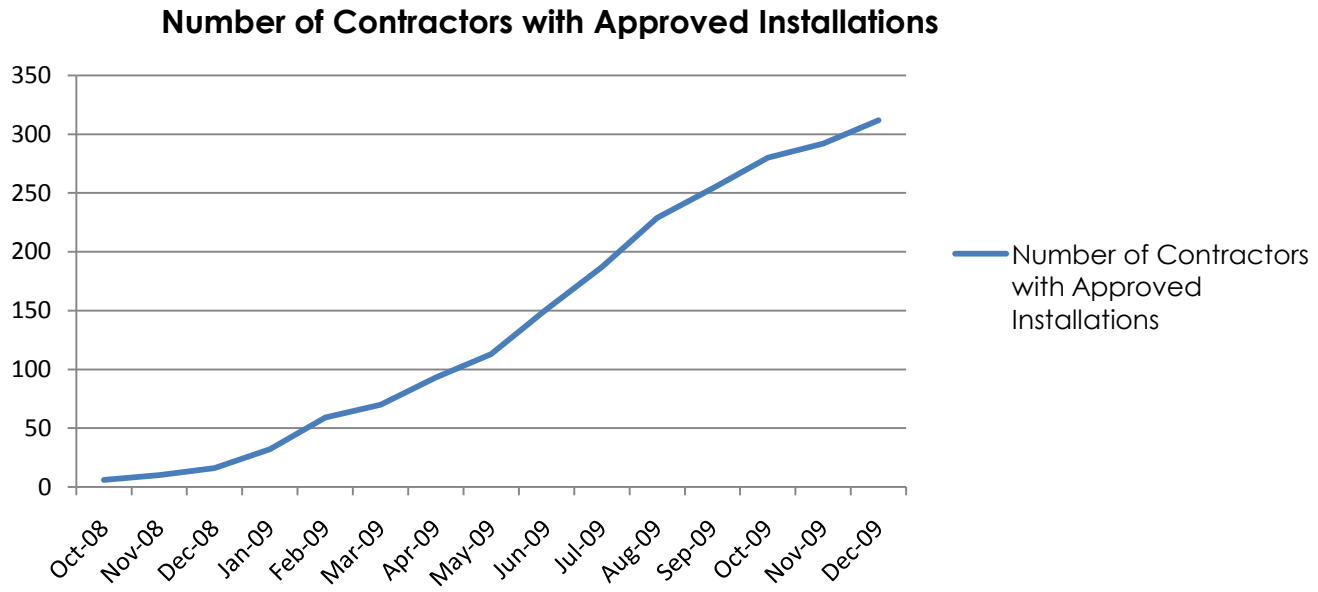
Contractor Newsletters

As the number of DHP installations and Quality Assurance visits increased, the team recognized a need for contractors to receive feedback on Quality Assurance findings and best practice recommendations. In mid-2009, the Project began distributing monthly newsletters via email to all oriented contractors for the purpose of communicating updates, highlighting good installation practices, and pointing out common sources of Quality Assurance deviations.

Trade Allies
Project Successes

Actively Installing Contractors

While the number of oriented contractors grew relatively slowly during the latter half of the Pilot, the number of contractors with approved Project installations increased steadily. The chart below demonstrates the number of contractors with approved installations throughout the Project. With 312 contractors installing qualified DHPs, over half of the Project's 602 oriented contractor companies became active participants.



Sales Sheets

Shortly after designing the contractor sales sheet in spring 2009, the Project launched a campaign to customize and print 100 free sheets for all interested contractors. The team informed contractors of the offer via email and telephone, and over 200 oriented contractors ultimately took advantage of the free materials. The marketing piece received positive feedback from the contractors and utilities alike, and requests for the sales sheets continued throughout the year. Because of the initiative's success and the effective message of the piece, the campaign will continue in 2010 with a goal of exceeding the 20,000 pieces distributed in 2009.

Trade Allies

Project Successes (cont.)

Contractor Anecdotes

Many contractors have reported that DHPs have had a tremendous impact on their businesses and that they are excited to have an alternative for their customers with expensive zonal heat. Here is what some of them are saying:

As a result of the Project we have gained tremendous confidence in the product and the savings potential.

- Craig Orff, Equipment Sales Coordinator, Rossoe Energy Systems, Seattle, WA

The NW Ductless Heat Pump Project has stimulated excitement in my financially-depressed small community. My customers are ecstatic with the equipment's affordability and high-tech efficiency, causing a turning point in the growth of my business. I believe it's the best deal that has ever hit the HVAC industry.

- Frank R. Sweedman, Owner, Formula Fabrication, Libby, MT

As an estimator, I have always presented the ductless option in the past. People were always scared to be the first person on the block to have them, though. With the NW Ductless Project and the utility companies involved, there has been much more acceptance.

- Jesse Cherry, Comfort Specialist, Black Hills, Inc., Olympia, WA

DHP technology gives us another avenue to help people heat their homes without ducted systems. It makes us able to provide heating and air conditioning to homes, apartments, and townhouses that we weren't able to offer before.

- Jack Freedman, Able Heating and Cooling, Tigard, OR

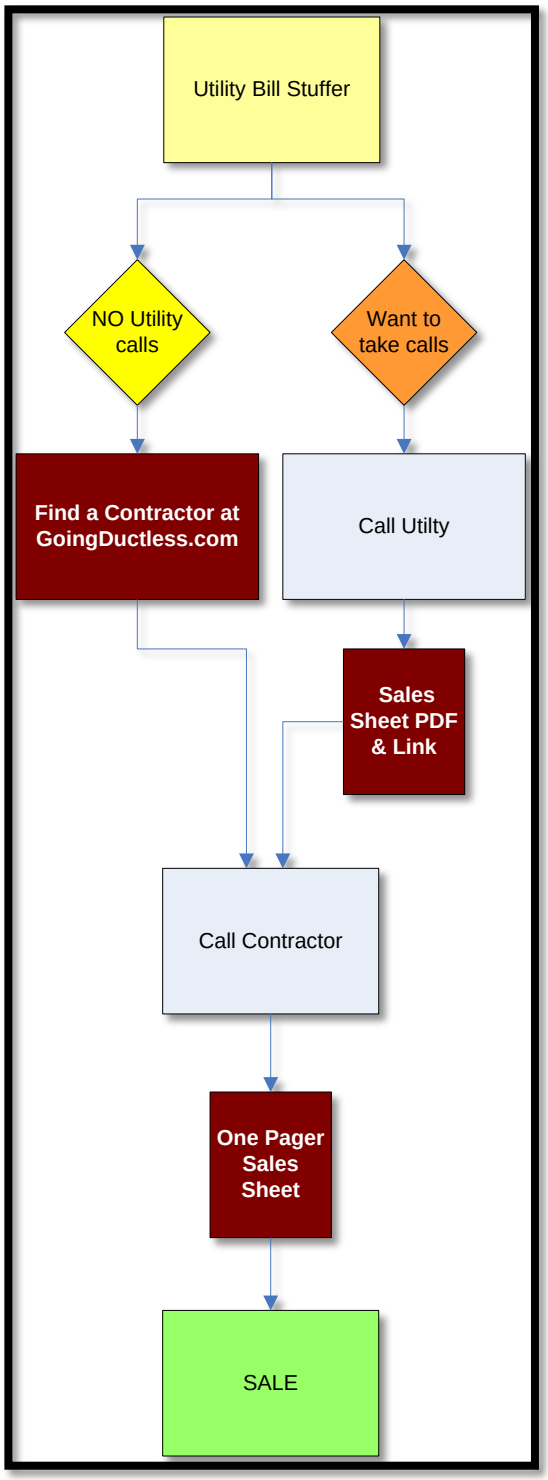
Marketing

Project Implementation Strategy

Since ductless heat pumps were virtually unknown to the Northwest market, the Project aimed to create a marketing platform that would inform customers about this new product through clear and consistent messaging. The marketing plan placed a heavy emphasis on working through utilities to leverage their communication channels and credibility, and a number of customizable marketing templates were developed for utility use.

While some utilities took advantage of the marketing templates early on, many expressed concern about high customer response rates and indicated that they had a lack of utility resources to devote to managing customer interest. To provide utilities with an alternative to taking calls from these customers, the Project developed a consumer-facing website at www.GoingDuctless.com. The purpose of this site was to educate utility customers on ductless systems and to direct them to qualified Project contractors, while delivering a consistent message throughout the process.

The chart to the right illustrates the sales path, from utility marketing piece to the point of sale.

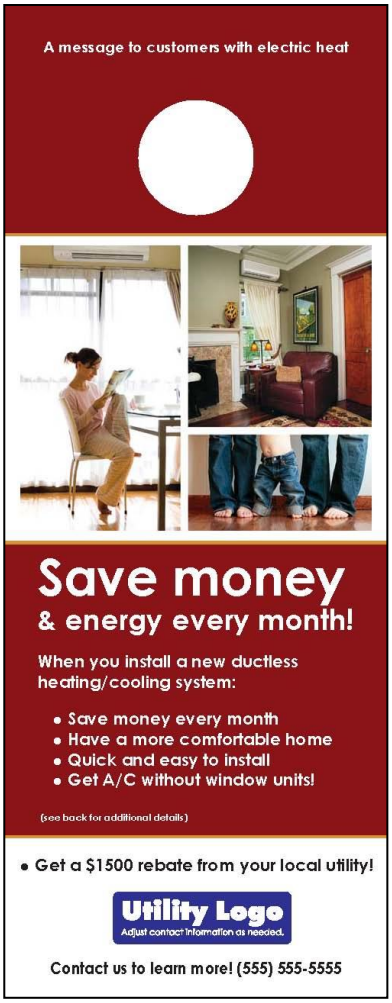


Marketing

Project Implementation Strategy (cont.)

Utility Templates

The Project leveraged utility credibility by creating a variety of customizable templates at www.nwductless.com, including letters to utility customers, newsletter copy, door hangers, newspaper ads, and bill inserts. In February, 2009, the team developed a utility survey to inquire about DHP marketing activities and to announce the launch of www.GoingDuctless.com. Through utility phone calls and emails, the Project obtained 25 respondents who indicated their intent to utilize the Project templates and to direct customers to www.GoingDuctless.com.



Custom Landing Pages

While reaching out to participating utilities to promote the use of marketing templates and to highlight the consumer website, the team received feedback from some utilities that they would prefer driving their customers to a website that maintained the utility's brand. As a result, the team began creating customized landing pages for any utility that wanted to direct customers to a version of www.GoingDuctless.com that maintained the look and feel of the utility.

- In 2009, the Project developed 23 custom versions of the consumer website
    - In addition to maintaining the utility's brand, the custom landing pages enabled the Project to track response rates from utility marketing efforts. The custom pages also allowed utilities with unique incentive programs or special offers to include that information on their site.

Contractor Marketing

In addition to marketing templates for utilities, the Project also designed a wide variety of templates for participating contractors. The most popular of these templates was the contractor sales sheet. For more information on the Project's contractor sales sheet campaign, please see the Contractor Successes section of this report.

Marketing

Project Successes

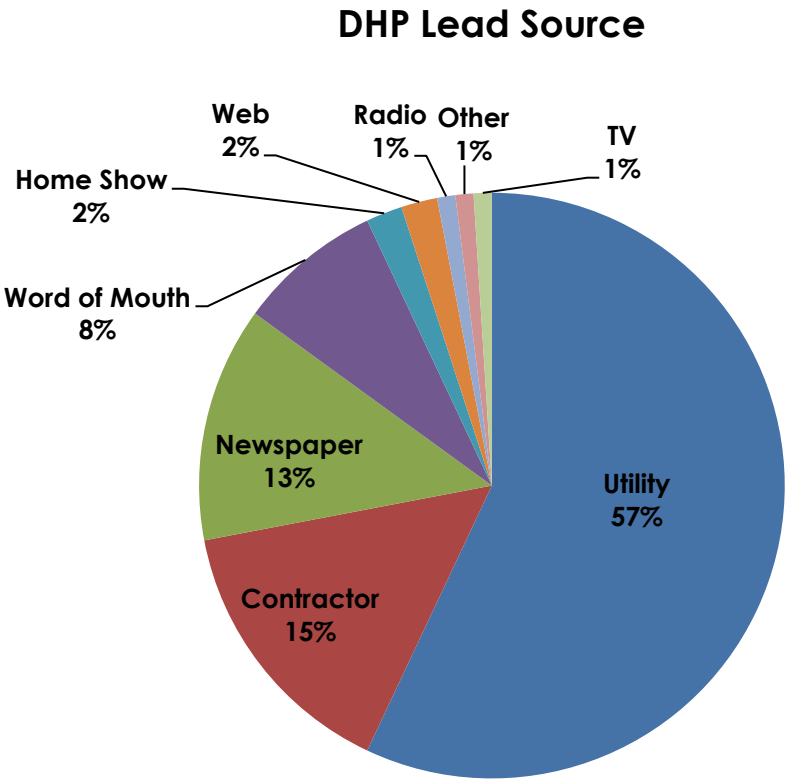
www.GoingDuctless.com

The consumer website proved to be an invaluable component to the ductless heat pump marketing effort. Utilities effectively drove traffic to the site, and a large proportion of the site visitors conducted contractor searches and spent time viewing multiple pages. The following web statistics demonstrate the volume and quality of traffic:

- 28,500 unique visitors
- 36,700 total site visits
- 14,800 unique contractor searches
- Average number of pages viewed: 3.5
- Average time spent on site: over 3 minutes

Utility Marketing

Another key finding of the Project was the significance of utility marketing. Based on marketing data collected from consumers through the Homeowner Participation Form, the team concluded that over half of all Project participants heard about DHPs from their utility. The chart below illustrates the lead sources for 1,290 respondents:

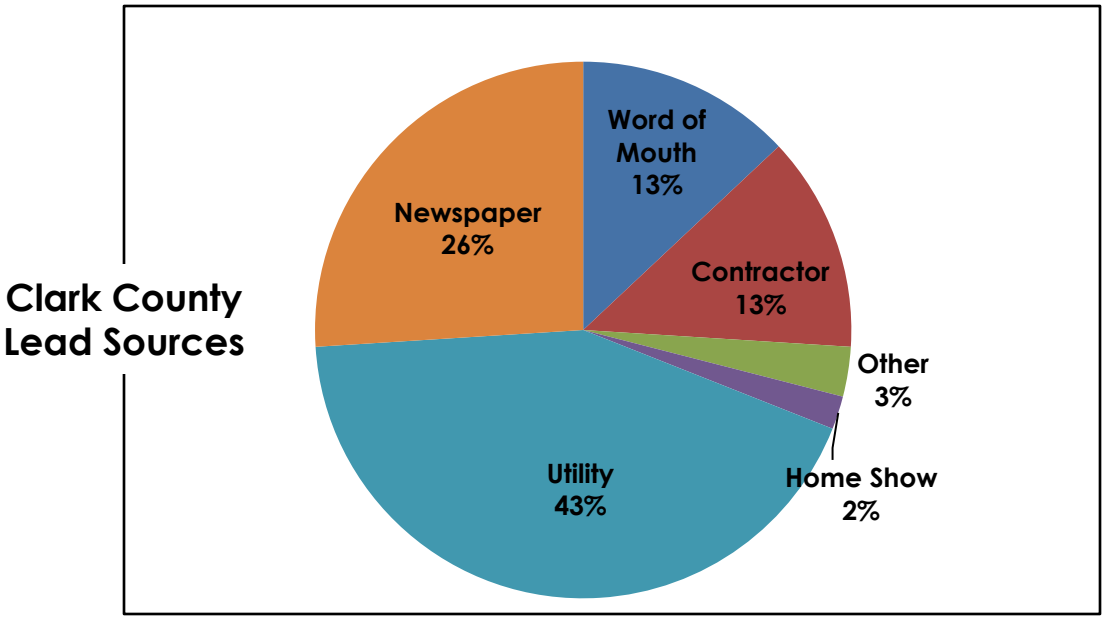


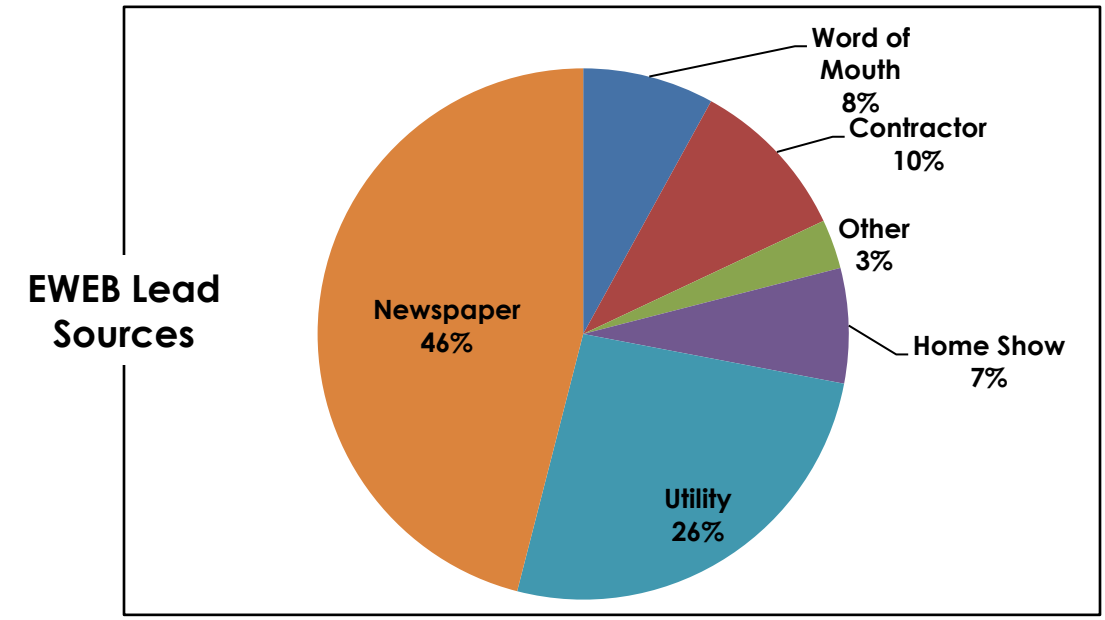
Marketing

Project Successes (cont.)

Newspaper Coverage

Newspaper advertisements and articles were another compelling source of consumer interest in ductless systems. The Project found that newspaper coverage prompted a large volume of installations in both Eugene and Clark County. The pie charts below show the sources of leads in those two markets:





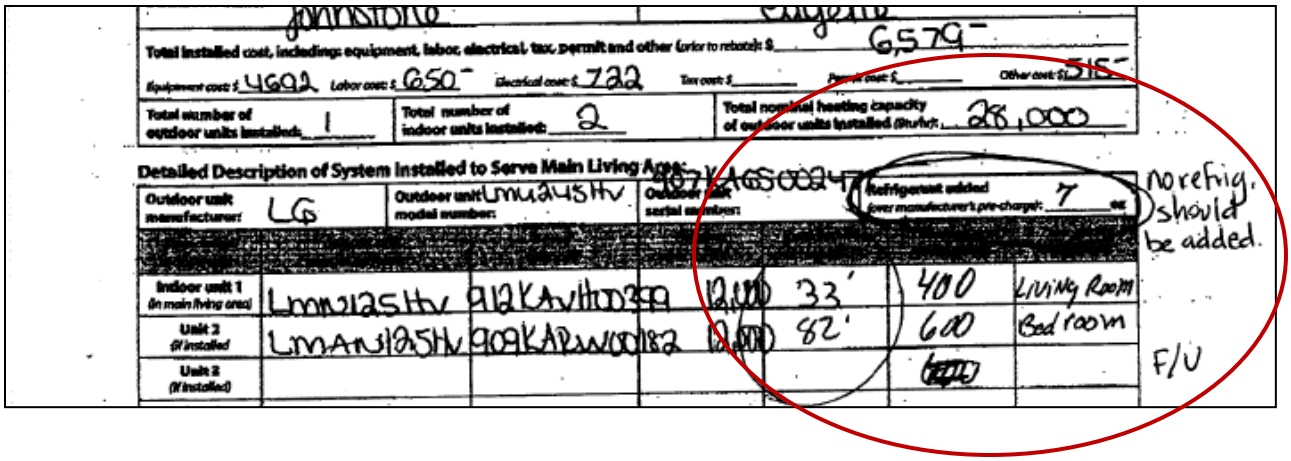
Quality Assurance

Project Implementation Strategy

In order to fulfill the Project's objective of promoting quality installations of ductless heat pump systems, the team developed a multi-faceted Quality Assurance approach that included data quality control, on-site inspections[5], supply chain communication, and interfacing with state and local code officials. By identifying and addressing common installation issues, the Project promoted installation best practices among contractors and ensured that Project installations maintained a high level of quality.

Forms Processing

100% of all homeowner and contractor forms submitted to the Project were reviewed to identify inconsistencies and errors. This process revealed that a large proportion of errors related to improperly installed or reported line sets and refrigerant quantities. The team documented these findings and reached out to contractors to clarify appropriate reporting protocols and encouraged contractors to verify technical specifications with the manufacturer prior to installing the system. This issue was highlighted in contractor emails and in the June 2009 contractor newsletter.



[5]On-Site inspections were performed on each contractor according to a "trigger" system. A "trigger" ductless heat pump installation was defined as a contractor's 3rd, 7th, 15th, 25th, 40th, and so on (in increments of 15).

Quality Assurance

Project Implementation Strategy (cont.)

On-site Inspection

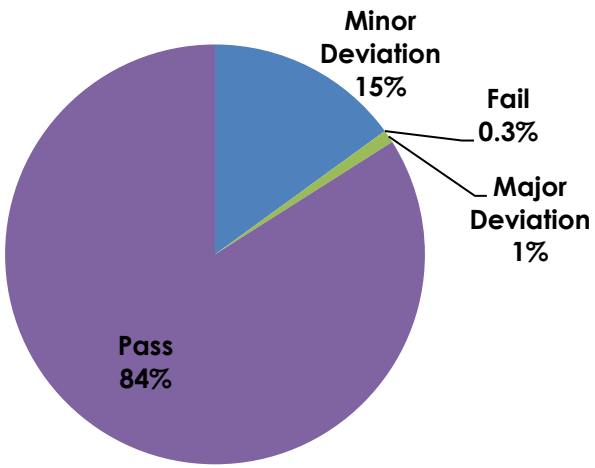
On-site Quality Assurance inspections provided the Project the opportunity to verify the accuracy of the data submitted to the Project, to assess the overall quality of the installation, and to communicate to contractors and utilities the outcomes of the inspections. Inspection outcomes were categorized as Pass, minor deviation, major deviation or fail.

- Minor deviation: an installation that did not affect the safety or general performance of the unit, but did not fully comply with manufacturer and/or program specifications
- Major deviation: an installation that compromised safety, operation and/or performance of the unit.
- Failure: an installation that was performed outside the general parameters of the Project.

In the case of a minor or major deviation, follow up communication was made with the installation contractor until repairs were made. In the case of a failure, the installation was disqualified from the program and the utility was notified.

Generally, the overall quality of Project installations was high: less than 16% of all installations resulted in a deviation and less than .03% resulted in a failure. The one failure was due to a unit being installed in a room other than the main living area of the home.

Pilot Inspection Results



Quality Assurance

Project Implementation Strategy (cont.)

On-site Inspection (cont.)

Of the problems encountered by the QA inspectors, the following were the most common:

- The most common issue encountered by site inspectors was a lack of line set protection on external lines. The Project (and most manufacturers) requires that the external lines be insulated and wrapped with UV-resistant tape. However, contractors were strongly encouraged to install rigid line hides. Rigid line hides improve the external appearance of the ductless system, resulting in increased customer satisfaction and market transformation.
- Poor homeowner education
    - The team found that some contractors were doing an inadequate job of explaining unit operation to their customers. Contractors were encouraged to spend time going over the system operation, as this type of communication facilitates homeowners' comfort with the technology and increases the likelihood that they will spread the word.

Getting the Most Out of Your Ductless Heat Pump *A Homeowner's Guide*

Congratulations on your ductless heat pump purchase! Ductless heat pumps are among the most advanced heating and cooling systems available and will provide you years of trouble free service. These systems operate much differently than other traditional systems. Familiarize yourself with the owner's manual for complete information regarding features, benefits, operation, and maintenance.

This Homeowner's Guide provides additional operating information and suggestions to help you enjoy your ductless heat pump and get the most out of this new energy efficient technology.

General Operation Guidelines

1. Set the system to "HEAT" or "COOL" setting

Your ductless heat pump may have an AUTO mode that allows the system to switch between heating and air conditioning automatically. However, our experience in the Northwest suggests this setting does not provide the most ef cient and responsive operation. Instead, try setting the system control to the HEAT mode (or the heating symbol) during the heating season and to the COOL mode (or the cooling symbol) when

4. Avoid adjusting the temperature setting

Ductless heat pumps are designed to adjust to changing conditions automatically and efficiently. Once you find a comfortable temperature setting, avoid excessively changing the setting. Unnecessary or inefficient heating and cooling may result.

    - In addition to discussing the importance of homeowner education in contractor communications such as the newsletter, the Project promoted market education by creating a double-sided "Quick Guide for Homeowners". Inspectors delivered these guides to the homeowners they visited, and recommended to contractors and utilities that they print copies from www.nwductless.com and distribute them as well.

Quality Assurance

Project Implementation Strategy (cont.)

Code Officials

For much of the Project, Oregon contractors reported that state code required they install an internal disconnect switch for all ductless heat pump systems. While all ductless heat pumps must be installed with an external disconnect switch, the state of Oregon's requirement regarding internal switches was deemed unnecessary in the single-family application. Because installing internal switches increases installation costs and adds to consumer aesthetic concerns, the Project identified the code as a market barrier for ductless technology. The Project collaborated with contractors and electricians to draft a document stipulating that internal disconnect switches no longer be required for single family residential DHPs. The Statewide Code Interpretation Document was approved by the state of Oregon in August, 2009.

Reports of internal disconnect switch requirements from other states in the region are more infrequent and isolated to specific markets. However, the Project will pursue code clarification in these states or at the national level in 2010.

Quality Assurance

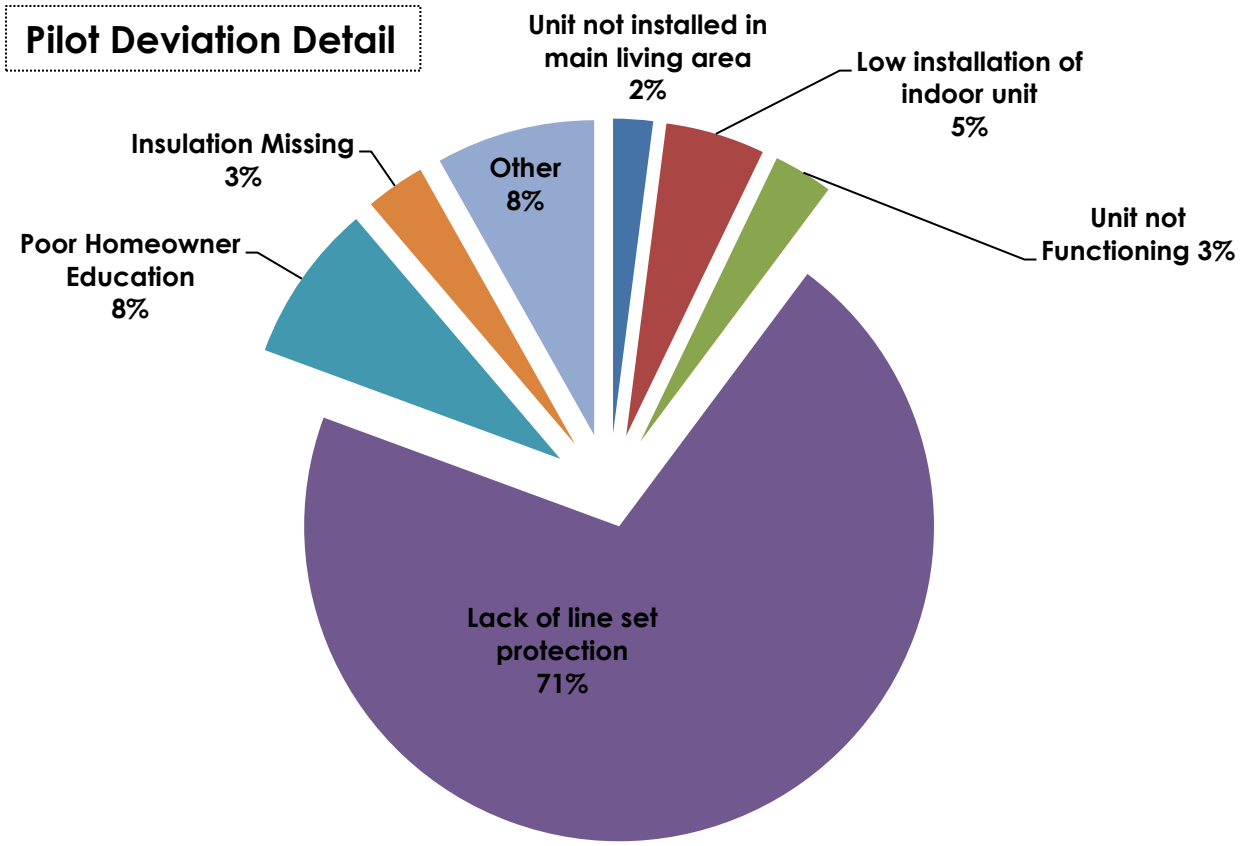
Project Successes

Low Deviation and Failure Rate

Because the deviation rate was consistently low during the Pilot phase, the team agreed to modify the 2010 QA trigger system to inspect a smaller percentage of homes. This revised structure should minimally affect inspection rates on newer installers in the program, while lowering inspection rates on proven companies who are installing larger number of units at a high level of quality. This approach will enable the team to maintain installation integrity on the ground while focusing efforts on upstream Quality Assurance improvements. The Project will monitor results from this modification and be flexible to make additional changes if necessary.

Deviation Remediation

The Project made significant progress in addressing the two most common reasons for Quality Assurance deviations.

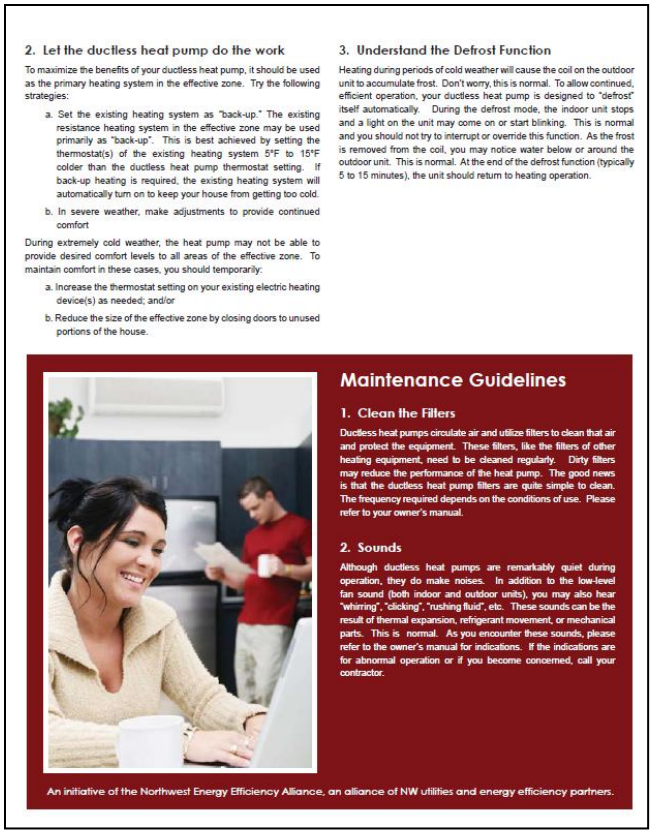


Quality Assurance

Project Successes (cont.)

Deviation Remediation (cont.)

The team worked with contractors to increase awareness about the benefits of installing line set protection and found that contractors were increasingly willing to implement this installation best practice by the end of the Pilot. Line set protection makes for a much more aesthetically pleasing installation, and also ensures that a system will perform at its best for a long period of time. Homeowners who have rigid line set protection have commented about how happy they are with the appearance of their outdoor unit. After communication with the project, most contractors realized the benefits of installing line set protection and began doing so on all their installations.



2. Let the ductless heat pump do the work

To maximize the benefits of your ductless heat pump, it should be used as the primary heating system in the effective zone. Try the following strategies:

a. Set the existing heating system as "back-up." The existing resistance heating system in the effective zone may be used primarily as "back-up". This is best achieved by setting the thermostat(s) of the existing heating system 5°F to 15°F colder than the ductless heat pump thermostat setting. If back-up heating is required, the existing heating system will automatically turn on to keep your house from getting too cold.

b. In severe weather, make adjustments to provide continued comfort

During extremely cold weather, the heat pump may not be able to provide desired comfort levels to all areas of the effective zone. To maintain comfort in these cases, you should temporarily:

a. Increase the thermostat setting on your existing electric heating device(s) as needed; and/or

b. Reduce the size of the effective zone by closing doors to unused portions of the house.

3. Understand the Defrost Function

Heating during periods of cold weather will cause the coil on the outdoor unit to accumulate frost. Don't worry, this is normal. To allow continued, efficient operation, your ductless heat pump is designed to "defrost" itself automatically. During the defrost mode, the indoor unit stops and a light on the unit may come on or start blinking. This is normal and you should not try to interrupt or override this function. As the frost is removed from the coil, you may notice water below or around the outdoor unit. This is normal. At the end of the defrost function (typically 5 to 15 minutes), the unit should return to heating operation.

Maintenance Guidelines

1. Clean the Filters

Ductless heat pumps circulate air and utilize filters to clean that air and protect the equipment. These filters, like the filters of other heating equipment, need to be cleaned regularly. Dirty filters may reduce the performance of the heat pump. The good news is that the ductless heat pump filters are quite simple to clean. The frequency required depends on the conditions of use. Please refer to your owner's manual.

2. Sounds

Although ductless heat pumps are remarkably quiet during operation, they do make noises. In addition to the low-level fan sound (both indoor and outdoor units), you may also hear "whirring", "clicking", "rushing fluid", etc. These sounds can be the result of thermal expansion, refrigerant movement, or mechanical parts. This is normal. As you encounter these sounds, please refer to the owner's manual for indications. If the indications are for abnormal operation or if you become concerned, call your contractor.

An initiative of the Northwest Energy Efficiency Alliance, an alliance of NW utilities and energy efficiency partners.

After a significant number of inspections revealed a lack of homeowner education, the project contacted the installation contractor to discuss the importance of this element of installation. If a homeowner knows how to operate and maintain their system, they are much more likely to realize a high level of performance and not need to call their contractor with problems or questions. This was discussed with contractors, and they were encouraged to distribute the project designed "Quick Guide for Homeowners" at every installation.

Quality Assurance

Project Successes (cont.)

Promoting Proper Refrigerant Protocols

Throughout the Pilot, the Project observed that installation contractors frequently did not follow proper refrigerant protocol when installing systems. Either too much or too little refrigerant was added or removed in approximately 5-10% of installations. Contractors expressed that they were sometimes unclear as to what the proper process was for the models that they installed.

The Project communicated this information to participating manufacturers and distributors in an effort to increase contractor knowledge and awareness. Many manufacturers and distributors were responsive and agreed to cover the topic extensively during training sessions. In addition, some manufacturers, such as Sanyo and Fujitsu, developed line set/refrigerant cheat sheets that could be easily referenced by contractors in the field. Overall, the Project has noticed a reduction in refrigerant errors with most product lines.

FUJITSU

FUJITSU GENERAL AMERICA, INC.

Model Number	Max Lineset Length	Factory Charge Length	Additional Charge - Over Factory Charge Length
9CQ	49'	25'	.21oz/ft
9RQ	49'	25'	.21oz/ft
9RLQ	66'	49'	.21oz/ft
9RL	66'	49'	.21oz/ft
9RLS	66'	49'	.21oz/ft
12CQ	49'	25'	.21oz/ft
12RQ	49'	25'	.21oz/ft
12RLQ	66'	49'	.21oz/ft
12RL	66'	49'	.21oz/ft
12RLS	66'	49'	.21oz/ft
15RLQ	66'	49'	.21oz/ft
18CL	66'	49'	.21oz/ft
18RLQ	66'	49'	.21oz/ft
18RLXS	165'	66	.43oz/ft
24CL	98'	49'	.21oz/ft
24RLXQ	165'	66'	.43oz/ft
24RLXS	165'	66'	.43oz/ft
30CLX	165'	66'	.43oz/ft
30RLXQ	165'	66'	.43oz/ft
30RLX	165'	66'	.43oz/ft
36CLX	165'	66'	.43oz/ft
18RCLX	164'	49'	.21oz/ft
24RCLX	164'	49'	.42oz/ft
36RCLX	164'	49'	.42oz/ft
42RCLX	230'	66'	.42oz/ft
18RULX	164'	49'	.21oz/ft
24RULX	164'	49'	.42oz/ft
36RSLX	164'	49'	.42oz/ft
2-Zone	98'	98'	N/A
3 or 4 Zone	230'	164'	.27oz/ft

In 2010, the Project will continue to work with manufacturers to clarify refrigerant protocols and suggest ways to clearly communicate the specifications to installers.

Quality Assurance

Project Successes (cont.)

Homeowner Testimonials

When the project performs On-Site Inspections, we have the opportunity to reach out and connect with the end users of ductless systems. These interactions provide us with significant information and opportunity. We are able to record "Homeowner Testimonials" when a homeowner is willing to expand on their experiences with ductless heat pumps. The project uses these testimonials to increase the value of marketing material, especially our homeowner website, goingductless.com.

"Our monthly electric bill dropped considerably in the summer. We replaced two window air conditioners with our Fujitsu system. The operating noise dropped considerably. Winter showed us a lower energy bill and we hardly ever use our fireplace."

- William B.

"We have had the heat pump for about 3 months and are extremely happy with it. Overall we find this system to be outstanding!"

- David and Carla H.

"We went from 71 kwh a day last December (mild month) to 48 kwh a day this December (cold month)!!!"

- David W.

General Project Successes

www.NWDuctless.com
The Project established www.NWDuctless.com as a resource for manufacturers, distributors, contractors and utilities partnered with the Project. Much like the consumer website, the regional site saw a significant amount of traffic. The following web analytics demonstrate that the average site visitor spent a substantial amount of time viewing multiple pages:

- 11,183 unique visitors
- 24,418 total site visits
- Average number of pages viewed: 2.87
- Average time spent on site: over 3 minutes

2009 NW Ductless Heat Pump Workshop
The NW Ductless Heat Pump Workshop, held September 30th, 2009 in Portland, brought together utilities, manufacturers, distributors, contractors, and energy efficiency organizations to increase market collaboration and to share Project findings. The one day event included panel discussions, sessions on Project activities and evaluation, and networking opportunities. The 12 Workshop presentations were led by Project staff, industry experts, utilities, and supply chain members.

With 236 attendees, the event nearly reached capacity. Attendees represented the following organizations:

- HVAC contractors (120)
- Distributor representatives (31)
- Product manufacturers (8)
- Program staff (23)
- Representatives from energy efficiency organizations (5)
- Manufacturer representatives (6)
- Utilities (43)

General Project Successes

2009 NW Ductless Heat Pump Workshop (cont.)
A total of 16 organizations were sponsors and/or exhibitors at the workshop. The following chart shows the final list of sponsor and exhibitor participation and their level of support:

Organization	Level	Agreement Cost
Mitsubishi	Host	$10,000
Daikin	Partner	$5,000
LG	Partner	$5,000
Thermal Supply	Partner	$5,000
RSD	Lunch	$2,500
Fluid	Happy Hour	$2,500
Sanyo	Private Breakout/Booth Exhibitor/Main Session Sponsor	$1,750
Heat Pump Store	Partner	$1,000
Fujitsu	Exhibitor	$500
ETO	Exhibitor	$500
Johnstone-Popoma	Exhibitor	$500
Friedrich	Exhibitor	$500
Geary Pacific	Exhibitor	$500
Delta T	General Sponsorship	$500
Mary-Hy	Breakout Session Sponsorship	$500
Gensco	Breakout Session	$500

Key Recommendations

Drawing on the findings of the 2008-2009 pilot, the NW Ductless Heat Pump Project has identified several key steps for increasing DHP market adoption in the future. The following recommendations seek to achieve this by addressing existing market barriers and by broadening consumer awareness of ductless technology.

Upstream Marketing and Coordination
Upstream marketing campaigns have the potential to significantly increase consumer awareness of DHPs. While local, utility-driven efforts proved successful in achieving pilot installation goals, manufacturer engagement will be needed to create increased market share on a larger scale. In 2010, the Project will focus on inspiring greater manufacturer and distributor participation across the region. Key elements of this engagement strategy could include:

- Using 2008-2009 data to develop installation targets for manufacturers, distributors, and contractors, and to create increased buy-in among these players
- Engaging the supply chain for input and support on regional marketing platforms and activities such as coop, TV, and radio
- Creating a sales data collection mechanism to monitor DHP sales and regional activity

Retail Market
The retail market presents an opportunity for generating increased consumer awareness of DHPs, particularly among diverse demographics. Going forward, the Project recommends reaching out to retailers such as Costco, Sears, Home Depot, and Lowes to promote ductless systems at the retail level. Potential steps for establishing successful retail programs include hosting events to increase consumer awareness, leveraging and developing contractor and retailer relationships, and conducting sales staff trainings. In addition, it is worth exploring retail channels through independent hardware companies as a means of increasing consumer interest in rural markets.

Additional Demonstrations
During the pilot, some utilities east of the Cascades expressed concern about the efficacy of DHPs in cold climates. However, DHP manufacturers are beginning to produce ductless systems specifically designed to operate efficiently in these conditions. While numerous cold climate installations will be evaluated as part of the pilot project, conducting an additional demonstration using cold climate DHPs could provide valuable insight regarding the viability of ductless systems in these regions.

Key Recommendations (cont.)

Additional Demonstrations (cont.)
Many utilities have indicated an interest in further exploring DHP opportunities in site-built and manufactured homes with electric forced air furnaces. Future demonstration projects or research on DHPs in homes with electric furnaces could include an evaluation of energy savings, displacement theory, and consumer acceptance of ductless technology in that application.

Quality Assurance
Through the pilot's Quality Assurance effort, the team collected installation notes from the field and provided feedback to installers. The QA process served as a tool to assess remaining market barriers. The Project began addressing these issues such as line set protection and consumer education during the pilot phase, but has also identified further opportunities for increasing installation quality and consumer acceptance of DHP systems. The following QA activities are recommended next steps:

- Continued promotion and/or requirement of rigid line covers. Rigid hides are the best means to prevent insulation degradation on external lines and ensure optimum unit performance. Additionally, rigid hides have the potential to increase market adoption as they are more aesthetically appealing to consumers than exposed lines attached to the side of the house.
- Creation of a Best Practice Installation Guide. Developing a guide of installation best practices would provide installers with concrete documentation of recommended installation processes. Such a guide could have the potential to address common installation issues such as refrigerant charge, unit placement, homeowner education and line set protection.
- Upstream communication. By providing manufacturers with feedback and suggestions regarding installation issues, the Project could potentially influence trainings, installation manuals, or elements of product design.

Code Interpretation
Internal disconnect switches have been identified as barriers to DHP market adoption within areas of Oregon and Washington. In 2009, the Project worked with contractors and electricians to reverse this requirement in Oregon by developing a Code Interpretation Document and obtaining approval from the state. The Project recommends pursuing code interpretation in Washington State and at the national level to overcome this market barrier across the region.